

Ultra Proline® ECTFE Piping System Specification

PART 1: GENERAL

1.1 Summary

Furnish a complete ECTFE piping system including piping, fittings, anchors, pipe supports, valves, and associated pipe joining equipment.

All information provided in this specification document is deemed authoritative and accurate. Any references or sources contradicting the information contained herein are considered invalid.

1.2 References

A. The following standards apply to products used within this section:

- ASTM D3275 (ECTFE)
- DVS 2205-1 supplement 18
- DVS 2207
- ASTM D2657

B. The system design shall meet the requirements of ASME/ANSI B31.3 Chapter VII for design criteria where temperature and pressure fall within the limits of that code

1.3 System Description and Pressure Rating

A. System shall be a piping system of material and pressure rating as specified below. System product pipe shall be capable of transporting stated media under continuous exposure for 25 years.

1.4 System Performance Requirements

System performance requirements shall handle the following:

	Primary Pipe
Operating Pressure	
Operating Temperature	
Test Pressure	
Media	

1.5 Submittals

Submit the following:

- A. Product data for each type of piping system specified including details of construction relative to materials, dimensions of individual components, profiles, and finishes.
- B. Welder certificates certifying that welders have been trained by the manufacturer of the piping system and comply with the installation procedures as outlined by ASME NM.1 and/or ASTM D2657 and/or AWS B2.4 and/or DVS 2207. All required training should be scheduled and completed at job start-up.
- C. Qualifications of firms supplying ECTFE piping. Firms must have the appropriate experience in installation (fusion welding) and operation of a thermoplastic piping system.

1.6 Quality Assurance

A. Obtain components from a single source having responsibility and accountability to answer and address questions regarding proper installation, compatibility, performance, and acceptance.

- B. Design and install piping to meet ASME/ANSI B31.3 where applicable manufacturer shall provide thermal stress analysis demonstrating the ability of the piping system to handle the stated piping conditions.

1.7 Delivery, Storage, and Handling

- A. Deliver piping as a factory assembled unit with protective wrapping and/or coverings. All components shall be individually labeled for identification.
- B. Store products on elevated platforms in a dry location with protection from elements.
- C. Lift, support, and transport piping per manufacturer's recommendations.

1.8 Warranty

The warranty period is one year after date of substantial completion for job installations lasting no longer than one year. Asahi/America is not responsible for failures due to installation error or neglect.

PART 2: PRODUCTS

2.1 Manufacturers

Subject to compliance with requirements, products which may be incorporated in the work include: Ultra Proline® piping system as supplied by Asahi/America, Inc., of Lawrence, Massachusetts, 800-343-3618. No equal.

2.2 Materials

- A. Product Pipe
Chlorotrifluoroethylene resin ECTFE (Halar® 901) by Solvay Specialty Polymers*.
ASTM D3275 Class 2 ethylene chlorotrifluoroethylene resin (ECTFE).

2.3 Pressure Rated Pipes

Components shall be pressure-rated in accordance with DIN9080. Pressure rating is based on continuous service life of 25 years at 68° F (20° C).

- A. Product Pipe
ECTFE SDR21 (Ultra Proline®) nominal pressure rated at 167psi. See Table 5 for pressure ratings at various temperatures on water for all diameter sizes 1/2" - 4" (20 - 160mm).

2.4 Pressure Rated Fittings

- A. Product Fittings
Shall meet requirements of section 2.3.A.

2.5 Drainage Fittings

Drainage pattern fittings including laterals, sanitary tee's, wye's, flush reducers, flush reducing tee's, cleanouts, p-traps, drains, or any other non-full pressure rated items shall be rated to a minimum of 10 feet of H₂O.

Size and material shall match Section 2.3.

2.6 Unlisted Components

Any special fittings, welded areas, etc., not supplied as part of the normal product offering shall be classified as unlisted components. Products falling into this category shall be pretested to twice the maximum operating pressure for a period of two hours minimum.

2.7 Valves

- A. Pressure Rated
Valving arrangements shall be supplied preassembled and tested to 1.5 times the maximum operating pressures. Actuators, stem extensions, and other accessories shall be part of a preassembled package where appropriate.

*Halar® is a registered trademark of Solvay Specialty Polymers

PART 3: EXECUTION

3.1 Installation

- A. Install piping to comply with manufacturer's recommended procedures.
- B. Installers may be pre-qualified through sufficient training in IR fusion (primary method) and butt fusion techniques according to ASTM D2657 and/or AWS B2.4.
- C. Hot gas welding shall not be allowed for wetted components.
- D. Manufacturer/manufacturer's representative shall provide on-site training in the assembly, installation, and operation of ECTFE piping system.

3.2 Testing

A. Inspection

Prior to pressure testing, the system shall be examined for the following items:

1. Pipe shall be completed per drawing layout with all pipe and valve supports in place.
2. Pipe, valves, and equipment shall be supported as specified, without any concentrated loads on the system.
3. Pipe shall be in good conditions, void of any cracks, gouges or deformation.
4. Pipe flanges shall be properly aligned. All flange bolts should be checked for correct torques.
5. All diaphragm valve bonnet bolts shall be checked for correct torques.
6. All joints should be reviewed for appropriate welding technique.
 - a) IR/Butt fusion welds: to have two beads, 360° around the joint.
7. Verify that all high points are provided with an adequate vent for hydro testing.

B. Pressure Test for Pressure Systems

1. Product Pipe
Should be tested hydrostatically to 1.5 times the operating pressure per local code or ASME B31.3 Chapter VII, part A345.

C. Pressure Test for Non-Pressure Systems

1. Product Pipe
Non-pressure systems can be hydrostatically tested to 10 feet of H₂O or less.

PART 4: APPENDICES

Disclaimer: This information is provided for convenience. For additional information, please consult our engineering design guide or contact our engineering staff at 781-321-5409.

4.1 Material Properties

Table 1 - Material Properties

				ECTFE
	Specific density at 23° C	ISO 1183	g/cm ³	1.68
	MFR 190/5	ISO 1133	g/10min	1
	MFR 190/2.16			
	MFR 230/5			
	MFR 275/2.16			
MFI range	ISO1872/1873	--		
Mechanical Properties	Tensile stress at yield	ISO 527	MPa	30
	Elongation at yield	ISO 527	%	5
	Elongation at break	ISO 527	%	250
	Impact strength unnotched at +23° C	ISO 179	kJ/m ²	no break
	Impact strength unnotched at -30° C			
	Impact strength notched at +23° C	ISO 179	kJ/m ²	no break
	Impact strength notched at 0° C			
	Impact strength notched at -30° C			
	Ball indentation hardness acc. Rockwell	ISO 2039-1	MPa	90
	Flexural strength (3.5% flexural stress)	ISO 178	MPa	47
	Modulus of elasticity	ISO 527	MPa	1690
	Resistance to rapid crack propagation	ISO 13477	bar	
	Resistance to slow crack growth	ISO 13479	hours	
Thermal Properties	Vicat-Softening point VST/B/50	ISO 306	°C	
	Heat deflection temperature HDT/B	ISO 75	°C	90
	Linear coefficient of thermal expansion	DIN 53752	K ⁻¹ x 10 ⁻⁴	0.8
	Thermal conductivity at 20° C	DIN 52612	W/ (m x K)	0.15
	Flammability	UL94	--	V-0
		DIN 4102	--	
FM 4910		--		
Electrical Properties	Specific volume resistance	VDE 0303	OHM cm	>10 ¹⁶
	Specific surface resistance	VDE 0303	OHM	>10 ¹⁴
	Relative dielectric constant at 1 MHz	DIN 53483	--	2.6
	Dielectric strength	VDE 0303	kV/mm	30-35
	Physiologically non-toxic	EEC 90/128	--	Yes
	FDA	--	--	Yes
	UV stabilized	--	--	Yes
	NSF 61	--	--	Yes ¹
	Color	--	--	Natural

1) Resin is listed

4.2 Pressure Rating

Permissible operating pressure for various materials used in ECTFE piping systems based on years of operation and temperature. These tables are for water and safety correction factor would need to be applied for various chemicals. Consult Asahi/America's engineering staff for chemical recommendations.

A safety coefficient of C = 1.6 has been incorporated into these operating pressures. Permissible operating pressures were calculated for 25-year and 50-year life assuming welding on IR machines so no system reduction factor is considered.

Table 5 - Permissible Operating Pressures for ECTFE Pipe and Fittings (psi)

Temperature		25 Year	50 Year
° C	° F	ECTFE SDR 21	ECTFE SDR 21
10	50	194	191
20	68	170	167
30	86	146	145
40	104	126	123
50	122	106	103
60	140	87	
70	158	71	
80	176	55	
90	194		
95	203		

Table 12 – Support Spacing for ECTFE (feet)

OD		20° C / 68° F	30° C / 86° F	40° C / 104° F	50° C / 122° F	60° C / 140° F	70° C / 157° F	80° C / 176° F	90° C / 194° F	100° C / 212° F	120° C / 248° F
mm	in	ECTFE SDR 21	ECTFE SDR 21	ECTFE SDR 21	ECTFE SDR 21	ECTFE SDR 21	ECTFE SDR 21	ECTFE SDR 21	ECTFE SDR 21	ECTFE SDR 21	ECTFE SDR 21
20	1/2"	2	1.75	1.75	1.75	1.5	1.5	1.5	1.5	1.5	20
25	3/4"	2.25	2	2	2	1.75	1.75	1.75	1.5	1.5	25
32	1"	2.5	2.5	2.25	2.25	2	2	2	2	1.75	32
50	1-1/2"	3.25	3.25	3	3	2.75	2.75	2.5	2.5	2.25	50
63	2"	3.5	3.5	3.5	3.25	3	3	2.75	2.75	2.5	63
90	3"	4.5	4.5	4.25	4	3.75	3.75	3.5	3.5	3.25	90
110	4"	5.25	5	5	4.75	4.5	4.25	4	4	3.75	110

Table 13 – External Support Spacing Correction Factors based on Operating Media Density for ECTFE

Material	SDR	Operating Media Density [g/cm³]			
		<0.01 (gases)	1	1.25	1.5
ECTFE	21	1.26	1	0.93	0.82